ROYAL ASTRONOMICAL SOCIETY.

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CAPT. W. H. SMYTH, R.N., Vice-President, in the Chair.

Major-General Sir Wm. Morrison, K.C.B. was balloted for, and duly elected a Fellow of the Society.

*Discovery of a new Satellite of Saturn.** By Mr. W. C. Bond, Director of the Observatory of Cambridge, U. S.

"As it may be interesting to the Society to know the evidence indicating the existence of an eighth satellite of *Saturn*, I subjoin, somewhat in detail, our observations upon it.

"On the 16th September, a point of light, resembling a star of the 17th magnitude, was noticed in the plane of *Saturn's* ring, between *Titan* and *Japetus*, by Mr. G. P. Bond, and entered by him in his diagram of the satellites and stars in the neighbourhood. On the 18th it was again seen similarly situated, and was recorded by us both, with a doubt expressed as to its character.

"The recurrence of nearly the same appearance on the 19th, induced us to apply the micrometer, with which the following measures were obtained from the object in question, which, for convenience, we shall designate by x.

1848. Sept. 19th, at 9^h 40^m,		x precedes *Japetus*	137″	Measured in the direction of the plane of the ring.
		Japetus precedes a star ...	344	
	12 00	x precedes *Japetus*..... ...	141	
		Japetus precedes the star...	366	
	13 15	x precedes *Japetus*	143	
		Japetus precedes the star...	375	

"These measures indicated that the suspected body partook of the retrograde motion of *Saturn*. At 13^h 30^m, the distance of x from *Saturn's* centre was 256″; x following *Saturn* in the direction of the plane of the ring.

"A map of the stars in the path of *Saturn*, for the two following nights, was made as a security against mistakes.

"The evening of the 20th proved cloudy.

"On the 21st the new satellite was compared with a star following it, near the plane of the ring.

Sept. 21st at 11^h 34^m	distance of x from star		276″
12 11	——		284
12 51	——		293

* See vol. viii. No. 9, for the simultaneous discovery of the same satellite by Mr. Lassell.

"The distance of x from the *centre* of *Saturn* was found to be,

Sept. 21, at $12^h\ 30^m$, x following *Saturn*				220″	1 measure.
22	10	30	——	192	5 measures.
23	9	05	——	145	5 ,,
28	9	00	x preceding *Saturn*	156	5 ,,

"On each of these nights, with the exception of the 22d, the observations were continued long enough to identify the satellite by its motion.

"The presence of the moon prevented our obtaining further observations of the new satellite till the 13th of October, although we lost much time in observing accidental stars, which could only be distinguished from the satellite by their not partaking of the motion of *Saturn*.

"On the 13th of October it was again seen following *Saturn*,

At $7^h\ 40^m$ x distant from centre of *Saturn* 202″

Oct. 14	7	00	x ——	152

"The motion of x among the stars was sensible in three hours.

Oct. 15, at $9^h\ 35^m$ x distant from centre of *Saturn* 92″·4, x following.

"The foregoing positions are approximately satisfied by a periodic time of 21 days.

"The orbit is nearly coincident with the plane of the ring."

We are informed by Mr. Everett, that the name selected for the satellite discovered by Mr. Bond is "*Hyperion*."

Mr. Lassell complains, "that he has been completely baffled by the weather, which has never been clear, except on moonlight nights." He suspects that *Hyperion* varies considerably in brightness.

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*Transit of Mercury.** *Nov.* 8–9, 1848.

CAMBRIDGE. (Professor Challis.)

	Greenwich M.T. h	m	s	
External contact	23	5	30·0	Professor Challis, Northumberland Equat^l,
Internal contact	23	6	47·8	power 215.
——	23	6	47·0	Mr. Breen, 5-foot Equat^l, power 120.

"The external contact was noted when planet had made a very small impression on the sun's limb. The internal contact well observed."

* Several gentlemen have misunderstood the description of the transit inserted in p. 550 of the *Nautical Almanac*, and so lost the *external* contact, which is, however, a very unsatisfactory phenomenon. The description in the *N.A.* applies to the transit as seen through an inverting telescope, *i. e.* the north, west, and east are the upper, right-hand, and left-hand limb, as seen in the telescope. This would have been evident on referring to the elements at p. 552. In the *N.A.* for 1849 ,p. xx, the Superintendent stated, to prevent such mistakes, "that the angles of contact have reference to the phases as seen in an inverting telescope."

GREENWICH, *Hospital School.* (MM. E. and J. Riddle.)

	Greenwich M.T. h m s	
External contact	23 5 38	E. Riddle.
——	23 5 36	J. Riddle.

"Both observers imagined that they saw some undulation of an atmosphere surrounding the planet. The true contact probably had begun before it was noted by the observers."

LIVERPOOL. 9-foot Equatorial Reflector, power 101. (Mr. Lassell.)

Distances of Centre of Mercury from Sun's Limb, E. and W.

1848.	Greenwich M.T. h m s	Planet—2d Limb. ′ ″	Greenwich M.T. h m s	1st Limb—Planet. ′ ″
Nov. 9	0 0 53·1	5 44·9	3 8 13·0	10 0·7
	4 15·2	6 8·7	13 7·0	9 29·6
	6 38·4	6 18·2	15 0·7	9 20·4
	9 12·7	6 30·8	17 7·1	9 8·4
	11 2·0	6 38·9	19 47·4	8 55·0
	15 22·2	7 5·1	3 22 9·4	8 42·8
	51 42·6	10 22·8		
	54 45·1	10 41·6		
	0 56 50·8	10 57·8		

Distances of Centre of Mercury from Sun's Limb, N. and S.

1848.	Greenwich M.T. h m s	S. Limb—Planet. ′ ″	Greenwich M.T. h m s	Planet—N. Limb. ′ ″
Nov. 9	1 11 28·6	17 42·6	2 53 56·5	10 55·8
	1 14 57·6	17 48·2	2 56 32·6	10 48·8
	1 16 27·8	17 54·1	2 58 3·6	10 44·0
	1 19 7·6	18 2·3	3 0 3·6	10 39·3
	1 21 30·4	18 9·8	3 1 27·0	10 31·9

"The day very fine, and the atmosphere pretty steady, though occasionally disturbed, especially in the early observations."

ASHURST.* (Mr. Snow.)

	Ashurst Sid. Time. h m		
External contact.....	14 20	45·55	5-foot equatoreal,
Internal contact.....	14 21	7·55	power 75.

"On entering the sun's limb the planet was decidedly pear-shaped, but became pretty round on forming the internal contact."

A careful measure with the double-wire micrometer gave the diameter of the planet

$$=9''\cdot63 \text{ at } 14^h\ 45^m \text{ Sid. Time.}$$

* Latitude ..... 51° 15′ 58″ N.
Longitude ... $0^h\ 1^m\ 10^s\cdot1$ W.

The first limb of the sun and the planet were each observed on the meridian over seven wires of the transit instrument.

	h	m	s	
First Limb of Sun at	14	57	58·57	Ashurst Sid. Time.
Mercury, centre.....	14	59	46·77	——

"The clock error well determined.

"The following differential observations were made with the 5-foot equatoreal, in Ashurst Sid. Time:—

Observations in R.A.

Sun's 2d Limb.			Mercury, Centre.			Sun's 1st Limb.			Mercury, Centre.		
h	m	s	h	m	s	h	m	s	h	m	s
14	53	51·55	14	53	35·75	17	33	32·35	17	34	32·55
15	9	29·55	15	9	7·85	17	45	57·55	17	46	52·05
16	11	29·55	16	10	55·55	18	4	39·55	18	5	27·05
16	15	14·55	16	14	29·15	19	11	14·55	19	11	37·05
16	17	25·05	16	16	39·55	19	12	52·55	19	13	14·55

In Declination.

Ashurst Sid. Time.			S.L.—Planet.	Ashurst Sid. Time.			Planet—N.L.
h	m	s	″	h	m	s	″
14	57	30	741·5	19	16	40	449·4
15	14	40	809·2				
16	19	55	845·5				
17	20	20	993·2				
17	21	55	998·3				
17	24	40	1005·4				
17	31	25	1030·8				
17	42	30	1046·5				

"The above are the results of observation merely."

Dr. Foster observed the transit at Bruges. He remarks the extreme *blackness* of the planet compared with that of the spots, the intensities he estimates as 8: 5. The telescope used was an achromatic, by Brand of Bruxelles, an excellent defining instrument, power 200. Dr. Foster states, that the planet had rather the appearance of a *globe* than of a *disc*, and that the difference of blackness between the planet and the spots was less remarkable when he used a reflector with a red shade. A diagram accompanied Dr. Foster's letter.*

The Astronomer Royal mentioned at the meeting, that the transit of *Mercury* was observed, by many observers, with several telescopes at the Royal Observatory, and in different ways, (the image of the planet being received, in one instance at least, on a screen). An appearance bearing analogy to Baily's *beads* was seen only in one instance, by Mr. Main, who observed an image thrown on a screen. The Astronomer Royal also stated, that the steadiness of the planet and of the sun's limbs was much greater in the telescopes placed out of doors than in those under cover.

* Dr. Foster wishes to direct the attention of astronomers to the apparent connexion between spots in the sun and an extremely wet season.

Extract of a Letter from Professor Schumacher.

"The passage of *Mercury* here has shewn some curious circumstances.

"I must premise, that the limb of the sun was undulating, and that at Altona the instruments were shaken by many passing carriages.

"I could not observe the exterior contact. When I saw *Mercury* he had already somewhat entered, viz.:—

At $23^h\ 46^m\ 34^s$ Altona M.T.

"I saw a fine line of light between *Mercury* and the sun; but it disappeared immediately afterwards, and the separation was first visible and permanent at

$23^h\ 46^m\ 52^s$

"Dr. Petersen observed the same contact in the Meridian Circle during the culmination, at

$23^h\ 46^m\ 9^s$

"Dr. Olde and M. Sonntag observed the contacts;—

	Exterior. h m s	Interior. h m s
Mr. Sonntag...	23 44 51	23 46 33 M.T.
Dr. Olde.....		23 46 41

"At Hamburg, M. Rümker observed with the meridian circle,—

Interior contact $23^h\ 46^m\ 40^s$ Hamb. M.T.

	Exterior. h m s	Interior contact. h m s
M. Weyer.....	23 45 24	23 46 56 Hamb. M.T.
M. G. Rümker	— — 27	
M. Jürgensen .		— — 58
M. Brymann. .	— — 47	— — 52

"Now if you will reduce the Hamburg Observations with -7^s to Altona M.T. you will see,

1. That my first moment agrees nearer than can be expected with the observations of M. Sonntag and M. Charles Rümker.
2. That my second moment comes near to the four Hamburg observers.
3. That Dr. Petersen is greatly in advance of all the other eight observers.

Meridian Observations of Mercury.

	h	m	s			Dec. °	′	″	
At	23	46	42	Hamb. M.T.	Mercury	−17	3	32·2	M. Rümker.
	23	46	14	Altona M.T.		−17	3	39·5	Dr. Petersen.

M. Le Verrier has published a new theory of *Mercury* in the *Connaissance des Temps* for 1848, and promises tables founded on the theory. In the *Comptes Rendus* of the 13th of November last, he shews that his formulæ give the first internal contact, seen from the centre of the earth, at

	Paris M.T. h m s	
Nov. 8	23 16 43	using the value of sun's diameter in the *Connaissance.*
	16 47	—— —— *N. Almanac.*
	16 58	—— determined by himself, at = 32′ dist^{ce} 1

He remarks, that his formulæ make the phases of transit about 4 minutes *later* than the *Connaissance*, which is nearly 20^{s} *earlier* than the *Nautical Almanac.*

URANUS.

Cape of Good Hope. In the Meridian. (Mr. Maclear.)

1847.	R.A. h m s	N.P.D. ° ′ ″	1847.	R.A. h m s	N.P.D. ° ′ ″
Sept. 19	1 3 52·17	...	Oct. 23	0 58 52·23	84 26 45·53
20	3 43·78	...	24	58 43·75	...
21	3 35·49	83 57 37·19	25	58 35·12	28 31·12
25	3 1·40	...	27	58 18·00	...
26	2 52·78	...	28	58 9·73	...
28	2 35·36	...	29	58 1·30	31 55·60
29	2 26·41	...	30	57 53·03	...
30	...	84 5 41·16	Nov. 1	57 36·81	...
Oct. 1	2 8·93	6 34·96	5	57 5·24	...
4	1 42·14	...	6	56 57·67	38 23·06
7	...	12 8·25	10	56 28·12	...
8	1 1 5·95	...	11	56 21·06	42 4·22
12	...	16 47·79	13	56 7·18	43 26·60
13	...	17 41·78	15	55 53·93	...
16	0 59 54·03	...	16	55 47·40	45 25·17
17	59 45·02	...	20	0 55 23·04	47 52·74
18	...	22 17·05	23	...	49 31·01
20	59 18·44	24 4·02	25	...	50 35·41
21	59 9·61	24 53·67	27	...	84 51 32·57
22	0 59 0·97	84 25 50·95			

NEPTUNE.

CAPE OF GOOD HOPE. In the Meridian. (Mr. Maclear.)

1847.		R.A. h m s	N.P.D. ° ′ ″	1847.		R.A. h m s	N.P.D. ° ′ ″
Aug. 12	22	6 19·86	102 18 9·80	Sept. 25	22	1 59·27	102 42 5·50
16		5 55·25	20 27·34	28		...	43 23·22
18		5 42·58	21 37·19	29		1 40·15	...
19		5 36·41	22 11·64	Oct. 1		1 31·14	...
20		5 30·17	22 47·43	3		...	45 22·64
21		5 23·76	23 22·49	4		1 18·01	45 45·40
25		4 58·77	25 41·47	8		...	47 12·20
26		4 52·34	26 17·92	9		0 58·47	...
27		4 46·14	26 51·95	16		...	49 34·91
31		4 21·42	...	17		0 32·20	...
Sept. 1		4 15·10	29 44·04	19		0 26·71	...
2		4 9·03	...	20		0 24·17	...
3		4 2·89	30 51·77	21		0 21·85	50 44·96
4		3 56·72	31 24·05	22		0 19·44	...
6		3 44·72	32 35·43	24		0 15·31	...
7		3 38·74	33 5·59	25		0 13·29	...
12		3 9·53	35 45·90	26		...	51 37·51
13		3 3·48	36 17·10	27		0 9·67	...
14		2 57·89	...	28		0 8·14	51 52·91
15		2 52·08	37 17·62	29		0 6·46	...
16		2 46·64	37 49·05	30		0 5·33	52 5·94
17		2 41·02	38 18·89	Nov. 1		0 2·88	...
18		2 35·84	38 49·03	4	22	0 0·51	...
19		2 30·37	...	5	21	59 59·75	52 32·70
20		2 24·92	39 45·98	6		59 59·30	102 52 34·81
21		2 19·56	40 13·87	7		59 59·26	...
22		2 14·39	40 43·54	8	21	59 59·03	...
23	22	2 9·37	102 41 12·35				

Mr. Maclear has given the following mean places of stars for Jan. 0, 1847, which have been compared with *Neptune*.

	R.A. h m s	Obs.	N.P.D. ° ′ ″	Obs.
B.A.C. 7722	22 2 26·36	35	102 18 53·8	2
Star 8th mag.	22 8 35·02	48	102 24 30·0	5
B.A.C. 7747			102 40 47·7	13

HAMBURG. Equatoreal. (M. Rümker.)

1848.	Hamburg M.T. h m s	R.A. h m s	Dec. ° ′ ″
July 7	12 0 56·8	22 18 9·22	−11 15 45·7
8	13 11 32·8	22 18 5·33	−11 16 6·7

With the Meridian Circle.

1848.	h	m	s	Dec.	1848.	h	m	s	Dec.
July 10	22	17	56·81	−11 16 59·3	Sept. 4	22	12	41·40	−11 47 31·5
11		17	52·92	17 23·9	7		12	23·24	49 15·6
12		17	48·60	17 46·6	9		12	11·45	50 23·6
22		17	2·30	22 27·1	12		11	53·95	52 0·7
23				22 48·7	14		11	42·43	53 6·2
27		16	36·40	25 1·2	15		11	36·72	53 37·0
29		16	25·38	26 1·4	20		11	8·98	56 9·9
30		16	20·03	26 35·4	21		11	3·63	56 39·9
Aug. 7		15	33·86	31 4·8	23		10	53·26	57 40·6
9		15	21·99	32 12·3	24		10	48·21	11 58 7·9
11		15	10·02	33 24·9	30		10	18·79	12 0 49·0
13		14	58·26	34 34·1	Oct. 1		10	14·20	1 15·5
18		14	27·22		2		10	9·36	1 40·8
22		14	2·17	39 55·1	6		9	52·34	3 13·5
25		13	43·70	41 40·5	7		9	48·18	3 33·5
28		13	24·75	43 28·1	10	22	9	36·73	−12 4 39·1
30	22	13	12·37	−11 44 38·9					

Ephemeris for Greenwich Mean Midnight. By Mr. Adams.

1848.	R.A. h	m	s	N.P.D. °	′	″	1848.	R.A. h	m	s	N.P.D. °	′	″
Nov. 30	22	9	3·45	102	7	3·1	Dec. 29	22	11	9·87	101	55	4·2
Dec. 1			6·12		6	47·6	30			15·89		54	30·3
2			8·92			31·4	31			22·00		53	55·9
3			11·85			14·4	1849.						
4			14·91		5	56·8	Jan. 1			28·21			21·0
5			18·07			38·4	2			34·51		52	45·5
6			21·40			19·4	3			40·90			9·6
7			24·83		4	59·7	4			47·38		51	33·1
8			28·38			39·3	5		11	53·96		50	56·2
9			32·06			18·3	6		12	0·62			18·8
10			35·86		3	56·	7			7·36		49	40·9
11			39·78			34·2	8			14·19			2·5
12			43·82			11·2	9			21·10		48	23·7
13			47·98		2	47·5	10			28·09		47	44·5
14			52·25			23·2	11			35·16			4·8
15			56·65		1	58·2	12			42·31		46	24·7
16		10	1·15			32·6	13			49·53		45	44·1
17			5·78			6·4	14		12	56·83			3·2
18			10·52		0	39·5	15		13	4·20		44	21·9
19			15·37			12·0	16			11·64		43	40·2
20			20·34	101	59	43·9	17			19·14		42	58·1
21			25·41			15·1	18			26·72			15·6
22			30·60		58	45·8	19			34·36		41	32·8
23			35·90			15·9	20			42·06		40	49·6
24			41·30		57	45·4	21			49·82			6·1
25			46·81			14·2	22		13	57·64		39	22·3
26			52·42		56	42·6	23		14	5·53		38	38·1
27		10	58·14			10·3	24	22	14	13·46	101	37	53·6
28	22	11	3·96	101	55	37·5							

IRIS.

HAMBURG. Equatoreal. (M. Rümker.)

1848.	Hamburg M.T. h m s	R.A. ° ′ ″	Decl. ° ′ ″
Sept. 23	14 34 54·2	130 22 23·8	+16 15 35·6
26	15 38 1·3	131 47 42·8	15 48 24·1
Oct. 1	14 51 26·6	134 3 32·0	15 0 6·8
3	16 49 50·8	134 58 59·6	14 39 47·6
6	15 47 26·3	136 16 6·8	14 12 5·0
25	16 23 35·5	143 51 10·8	11 4 33·9
26	15 10 30·2	144 11 46·0	10 55 28·4
28	16 4 1·4	144 55 16·6	+10 35 55·6

HEBE.

HAMBURG. Equatoreal. (M. Rümker.)

1848.	Hamburg M.T. h m s	R.A. ° ′ ″	Decl. ° ′ ″
Sept. 4	14 28 9·4	83 47 22·9	+7 59 51·4
5	14 36 55·9	84 11 19·4	7 56 29·9
6	13 58 33·7	84 35 20·7	7 52 55·3
7	14 23 11·7	84 59 25·5	7 49 26·2
9	13 58 53·3	85 46 6·6	7 42 5·8
12	14 35 57·4	86 55 8·0	7 30 11·6
14	13 8 23·0	87 38 0·5	7 22 31·0
15	15 46 48·8	88 0 47·0	7 17 34·1
20	13 29 28·8	89 44 35·2	6 56 12·0
21	13 12 58·0	90 4 9·5	6 51 51·1
22	13 26 41·3	90 24 2·0	6 47 3·4
23	12 55 57·6	90 42 54·5	6 42 13·4
24	12 55 40·4	91 1 51·8	6 37 51·9
26	14 9 40·0	91 40 18·5	6 27 21·5
30	13 37 57·8	92 49 38·9	6 7 36·5
Oct. 1	12 38 5·7	93 3 41·6	6 0 56·0
7	12 30 6·6	94 37 33·3	5 31 12·0
8	13 6 57·6	94 51 53·5	5 25 59·4
10	11 41 56·2	95 17 50·6	5 15 49·7
25	11 49 29·0	97 42 41·5	3 38 15·6
	14 54 4·2	97 43 39·9	3 37 41·7
26	11 46 58·4	97 48 50·6	3 53 26·9
	13 21 6·6	97 49 9·2	3 53 10·1
28	14 10 38·7	98 20 39·7	+3 44 56·4

VESTA.

HAMBURG. Meridian Circle. (M. Rümker.)

1848.	R.A. h m s	Decl. ° ′ ″	1848.	R.A. h m s	Decl. ° ′ ″
Sept. 7	0 17 42·33	−10 33 24·1	Sept. 24	0 2 36·43	−12 31 51·6
9	0 16 3·99	10 48 47·8	30	23 57 12·46	13 3 1·7
12	0 13 30·46	11 11 24·6	Oct. 1	23 56 20·45	13 7 28·3
14	0 11 44·87	11 26 4·2	6	23 52 11·99	13 26 21·0
15	0 10 51·01	11 33 16·2	7	23 51 25·12	13 29 22·8
20	0 6 17·23	12 7 18·3	10	23 49 11·17	−13 37 9·6
23	0 3 31·52	−12 26 0·7			

MAUVAIS' THIRD COMET.

CAMBRIDGE, U.S. (Mr. W. C. Bond.)

"By five micrometrical comparisons with 18 *Leonis*, its position was found to be,

1848.	Cambridge M.T. h m	R.A. h m s	Dec. ° ′ ″
April 21	9 9	9 37 41·8	+12 29 7

referred to the mean equinox of Jan. 1.

"The comet was faint, but admitted of pretty good determinations. It exhibited to the last the star-like scintillations which have all along distinguished it."

ENCKE'S COMET.

"The comet was first seen at Cambridge, U. S., on August 27. It was a faint patch of misty light, 1′ or 2′ in diameter.

"At 14^h local M.T., R.A. $= 3^h\ 19^m\ 28^s$, Dec. $+31°\ 57'$ by the instrument corrected.

1848.	Cambridge M.T. h m s	Star—Comet. R.A. m s	N.P.D. ′ ″	No. of Obs.	Star.
Aug. 29	12 50 53	+0 9·33	+5 35·2	18 9	*a*
30	12 57 36	+0 18·97	−3 51·3	12 10	*b*
31	12 40 1	+1 20·05	−2 20·8	10 10	*c*

Approximate Places of Stars of Comparison.

		R.A. h m s	Dec. ° ′	
a	10 mag.	3 23 40	+32 31	
b	10–11 mag.	3 26 6	+33 2	Another star precedes this by 13′·6
c	9 mag.	3 29 20	+33 21	

"From the faintness and diffusion of the comet, these determinations may be uncertain 10″ or 15″. Something like a centre is, however, suspected."

HAMBURG. (M. Rümker.)

	Hamburg M.T. h m s	R.A. ° ′ ″	Dec. ° ′ ″
Sept. 23	8 51 8	71 39 16·4	+44 13 55·0
24	8 54 27	73 9 45·6	44 52 30·8
Oct. 1	9 29 48	86 48 47·3	49 31 31·5
5	14 46 53	99 7 54·1	51 58 19·5
6	10 23 7	101 59 48·4	52 20 42·3
7	11 35 17	105 54 32·9	+52 43 15·9

PETERSEN'S SECOND COMET.

"On the evening of October 26, at 8 P.M. Dr. Petersen discovered a telescopic comet in the constellation *Draco*. It is tolerably large, and has an evident nucleus. It was carefully compared the same night with a small star, and its hourly motion found to be about + 11ˢ in R.A. and + 1′ 20″ in N.P.D."

ALTONA. (Professor Schumacher and Dr. Petersen.)

1848.	Altona M.T. h m s	R.A. h m s	Decl. ° ′ ″
Oct. 26	11 41 20·2	18 18 7·9	
	11 50 5·3		+63 11 53·3
Nov. 4	12 9 30·1	18 59 33·0	+57 45 41·6

BERLIN. (Professor Encke.)

	Berlin M.T. h m s	R.A. ° ′ ″	Decl. ° ′ ″	Arg. Zones.
Oct. 28	8 27 43·9	276 38 1·3	+62 12 32·6	
29	7 59 50·3	277 44 51·5	61 39 38·7	
30	7 33 28·4	278 52 19·7	61 5 34·3	
Nov. 2	9 58 47·2	282 26 33·9	59 10 29·2	
7	6 36 39·0	288 6 2·4	55 44 58·1	xvi, 8 : xxxviii, 8
8	8 29 47·8	289 21 14·8	54 54 43·8	— 32 — 23
9	6 28 32·7	290 25 23·7	54 10 39·6	— 24
10	9 21 36·2	291 43 31·2	+53 14 58·2	xiv, 53

"If in Zone xvi. 32, you read 20ˢ·75 instead 19ˢ·75, which Professor Encke thinks should be done, the R.A. of Nov. 8 must be diminished 7″·5."

HAMBURG. (M. Rümker.)

1848.	Hamburg M.T. h m s	R.A. h m s	Decl. ° ′ ″
Oct. 28	9 14 27	18 26 42·49	+62 11 10·1
29	10 37 24	31 33·52	61 35 29·0
Nov. 2	8 11 52	18 49 30·19	+59 13 8·5

Observations at Markree. (E. J. Cooper, Esq. & A. Graham, Esq.)

	G.M.T.	Comet's R.A.	÷Δ	Comet's Decl.	÷Δ
	h m s	h m s		° ′ ″	
Nov. 1	10 28 25·3	18 45 24·19	+[9·8237]	+59 46 48·1	+[0·5290]
2	8 58 8·0	18 49 45·53	+[9·7765]	59 10 46·0	+[0·2510]
3	7 54 38·4	18 54 12·53	+[9·6911]	58 32 54·1	+[9·9272]
7	7 43 48·1	19 12 47·86	+[9·6345]	+55 41 5·0	+[0·0160]

Nov. 1. Piazzi xviii. 220 — 10 Comparisons by E. J. C. and A. G.
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2. B.A.C. 6463 — 8 Comparisons by E. J. C. and A. G.

3. ✳ observed with circle — 10 Comparisons by A. G.
App. R.A. $18^h\ 52^m\ 7^s{\cdot}88$
App. Dec. $+58^\circ\ 33'\ 9''{\cdot}3$

7. Observed with circle — 10 Comparisons by A. G.
R.A. $19^h\ 11^m\ 17^s{\cdot}23$
Dec. $+55^\circ\ 41'\ 2''{\cdot}9$

Elements.

By Professor Encke, from Berlin Observations of Oct. 28, 30, and Nov. 2.

T = 1849, Jan. 19·68270 Berlin M.T.

Log. q = 9·982056
π = 63° 8′ 16″·7
Ω = 215 2 3·9
i = 85 10 55·0. Motion direct.

By Dr. Petersen and M. Sonntag, from the Altona Observations of Oct. 26 and Nov. 4, and the Berlin Observation of Oct. 30.

Perihelion Passage, 1849, Jan. 20·08372 Berlin M.T.

Long. Perihelion ... 62° 35′ 15″·3
— Node ..... 214 40 30·4 } App^t Eq^x Oct. 30
i ..... 85 26 21·7

Log. q = 9·9840412. Motion direct.

Professor Schumacher says, — "Dr. Petersen has tried several suppositions to make the present comet go through the estimated (they are not observed) places of the comet of 1780, but cannot represent the latitudes of 1780 within 40°. The three observations are mere estimations, and the time of the observations is also estimated and supposed to be 7^h. Olbers has given these estimations under the following form: —

1780.	h	Longitude. s	° ′	North Lat. ° ′
Oct. 18	7	viii	27 22	15 21
20	7	—	26 38	12 51
26	7	—	25 22	5 53½

"According to Dr. Petersen's Elements, the present comet will

pass its descending node on the last day of this year, and only 0·02 distant from the earth's orbit. I am curious to know if more approximate elements will confirm this vicinity of the two orbits."

By Mr. Graham, from the Altona Observation of October 26 and the Markree places of November 1 and 7.

T 1849, January 22·52 G.M.T.

π ..... 62° 6′ 10″

Ω 212 21 38

i 87 7 4

Log. q ..... 9·98940. Motion direct.

By Mr. Hind, from the Observations of October 26, 29, and November 4.

T 1849, January 20·69169

π ..... 62° 4′ 42″

Ω 214 11 49

i 85 46 50

Log. q ..... 9·9985266. Motion direct.

By M. George Rümker, from Altona Observation, Oct. 26, and Hamburgh Observations, Oct. 29 and Nov. 2.

Perihelion Passage, 1849, Jan. 21·0162811 Greenwich M.T.

	°	′	″
Long. Perihelion...	61	50	21
— Node.....	214	0	54·7
Inclination	85	54	48·5

Long. Per. Dist. 9·986144. Motion direct.

Occultations of Stars by the Moon. By Mr. Snow, at Ashurst.*

			Immersion. h m s	Emersion. h m s
1847. June 1	ϱ' Sagittarii...	Ashurst ...	17 8 11·55	18 22 41·05
1848. Feb. 12	75 Tauri	— ...	4 38 54	—
May 7	67 Geminorum	— ...	13 9 16	—
—	k Geminorum	— ...	13 33 32	14 8 21
July 11	θ Libræ	— ...	16 15 20·6	16 47 28·6

The instrument used at Ashurst is a 5-foot equatoreal, aperture 4 inches. The time is Ashurst Sidereal Time.

"ϱ^1 *Sagittarii* immerged, at the moon's bright limb, *slowly*, like a body with a disc. Emerged instantaneously.

"An emersion of *Aldebaran* was observed in London with a $3\frac{1}{2}$-foot refractor, power 62. The star hung for about 5^s on the moon's bright limb, but I saw no projection on the moon's surface. Definition very good."

* Lat. 51° 15′ 58″ N. Long. $0^h\ 1^m\ 10^s{\cdot}1$ W.

The Method in Use at the Cambridge Observatory of Measuring Differences of Right Ascension and North Polar Distance by an Equatoreal provided with Clock-movement, and of Correcting the Observations for Refraction. By Professor Challis.

"Differences of north polar distance are usually measured by the Northumberland equatoreal, by means of a small sector of a large circle, on the limb of which are inscribed equidistant divisions, separated by an arbitrary but ascertained interval. A similar sector can be clamped to any part of the hour-circle, and differences of right ascension measured in an analogous manner. This is effected by an arrangement contrived by Mr. Airy (who contemplated the kind of observation here described), by which the instrument may be moved about its polar axis independently of the hour-circle, while the latter is carried nearly at the rate of sidereal time by a clock. The hour-circle sector has been substituted for the hour-circle itself, because the divisions of the latter are on brass, and not so well adapted for accurate bisection as those of the sector, which are on white metal; and because the equi-distance of the divisions, which is the essential condition, is more likely to be secured in a small portion of a circle than in a complete circle. The intervals of both sectors are subdivided by microscope-micrometers. The following is the method of taking the observations.

"It is generally required, and always desirable, to measure simultaneously differences of right ascension and north polar distance. Accordingly the object is bisected by the equatorially adjusted wire, *very near* the transverse wire, so that the rate of the clock, gaining or losing as the case may be, soon brings it upon the latter wire, the observer taking care, in the meantime, that it remains bisected by the other. The instant of simultaneous bisection by the two wires is noted, and the microscope-micrometers of the two sectors are then read off in integral intervals and revolutions, and parts of a revolution. This process is *commenced with the star*, or point of reference; the object referred is next observed in the same manner, and so on alternately, the series *concluding with the reference star*. In case the compared object be too faint for observation with micrometer wires, the practice with the Cambridge equatoreal is to use a diaphragm bounded by straight edges at right angles to each other, and the object being placed near the angular point in the prolongation of the edge which is equatorially adjusted, the instant at which its centre is brought into coincidence with the angular point by the clock's rate is noted. In other respects the operation is the same as that just described. The chronometer is compared with the transit-clock at the end of the series (sometimes, also, before its commencement), and finally the barometer and thermometer are read off.

"With respect to the reduction of the observations, the chief things to remark upon are the corrections for the clock's rate, and

for refraction. The differences of the hour-circle sector readings for the *star* are entirely due to these two causes, if the instrument be supposed to be in good adjustment. The star being known, and the times of bisection known, the effect of refraction on the hour angles are calculated for each observation of the star, by a process which will be presently stated. Corrections for refraction being applied to the hour-circle sector readings for the star, the remaining differences are due to the clock's rate, and, by comparison with the times of bisection, determine the rate. The *correction for rate of hour-circle* is a part of the loss or gain in the interval between *consecutive* bisections of the star, which bears the same ratio to the whole, as the interval from either bisection of the star to the bisection of the planet or comet bears to the interval between the two bisections of the star. The following is the formula for this correction, the sidereal times of the three bisections, in the order of their occurrence, being s_1, σ, s_2; H being the excess of the hour-circle sector reading for the star at s_1 above the reading at s_2 converted into time; and R the excess of the correction for refraction in hour-angle for the star at s_1 above that at s_2 :—

$$\text{Correction for rate of hour-circle} = \frac{\sigma - s_1}{s_2 - s_1}(\text{H} + \text{R}).$$

This formula gives the quantity to be *added* to the algebraic excess of the sector reading for the comet or planet, above that sector reading for the star which was taken at the time s_1, and is sufficient for all cases.

"It is to be remarked, that if the difference of the sector readings be affected by any other source of error acting proportionally to the time, as, for instance, want of adjustment of the instrument, such error is eliminated by the above calculation. For this reason, to ensure greater accuracy, the excess of the reading of the *declination* sector for the compared object, above that for the star at the time s_1, is also corrected by the process just indicated, although that excess is unaffected by the clock's rate. The formula for this purpose is precisely the same as that given above; H, in this case, representing the excess of the declination sector reading for the star at s_1 above the reading at s_2, converted into arc; and R the excess of the correction for refraction in north polar distance for the star at s_1 above that at s_2.

"After applying the corrections now considered, it is presumed that the instrumental measures of differences of apparent right ascension and north polar distance are affected only by refraction. The total refractions for the star in R.A. and N.P.D. have been already required, and therefore the obvious course is to calculate, also, the total refractions for the planet or comet, and thence deduce the differences of refraction corresponding to the measured differences of R.A. and N.P.D. It may be questioned, whether any approximate formulæ, requiring only the calculation of differences of refraction, would lead to a less amount of calculation in this kind of observation. If P be the pole of the heavens, Z the

zenith of the observer, S the place of the object. and Z Q be drawn a perpendicular on P S, the formula used for the total corrections for refraction in R.A. and N.P.D. are the following:—

$$\text{Correction for refraction in N.P.D.} = \text{A.} \tan (\text{P S} - \text{P Q})$$

$$\text{Correction for refraction in R.A.} = \text{A.} \frac{\tan \text{Z Q}}{15}. \operatorname{cosec}. \text{P S}. \sec (\text{PS} - \text{P Q})$$

The factor A is given by the tables in Bessel's *Astronomische Untersuchungen*, vol. i. pp. 198, 199, the argument in the case of the star being the *true* zenith distance, which is obtained by the formula sec. Z S = sec. Q Z sec. (P S − P Q). The argument in the case of the compared object is the *apparent* zenith distance, which is deduced from the same formula, the apparent N.P.D. and hour-angle being first obtained by applying the corrections for refraction in N.P.D. and R.A. of the star (with signs changed) to its true N.P.D. and R.A., together with the measured differences of N.P.D. and R.A. affected only by refraction.

"The above calculations will be much facilitated by two tables, one containing the values of P Q, log. sec. Q Z, and log. $\frac{\tan \text{Q Z}}{15}$ (to five figures) for every minute of hour-angle from 0^h to 6^h, which will be found to require interpolations only to first differences, and which is, in fact, merely an expansion of the table mentioned in the *Monthly Notices*, vol. viii. No. 9, p. 210. The other is a table for obtaining the factor A. It will save much trouble, and be sufficiently accurate to take account of the barometer and thermometer by the empirical formula given in the *Monthly Notice* above cited, viz. :

$$\text{Log A} = \log k + 0{\cdot}015\ \text{B} + 0{\cdot}001\ (100^\circ - \text{T}),$$

in which log k is log α or log α' of Bessel, according as the argument is the true or the apparent zenith distance, diminished by the constant 0·49572. Any error which the use of this formula induces, will very nearly disappear in the *differences* of the refractions. Thus the second table need merely consist of values of log α − 0·49572, and log α' − 0·49572; and the most convenient argument is log. sec. Z S, the consecutive logs. differing by 0·01. This table would, therefore, very well range with the table of values of log. α'' − 0·4957, required in the computation of differential refractions."

Professor Mädler having expressed a wish that certain stars should be re-observed in the southern hemisphere, the President and Council forwarded the request to Mr. Maclear, with a recommendation to comply with it, if convenient. We have received from Mr. Maclear the reduced observations, and the results are published here as the readiest way of communicating with Professor Mädler.*

* A letter was sent to Professor Mädler, offering to procure for him the Catalogues of Johnson, Taylor, &c., but it probably never reached him.

Mean Places of Southern Stars for January 1, 1847.

B.A.C.	R.A.	Mean R.A. h m s	Ann. Prec. s	Obs. in N.P.D.	Mean N.P.D. ° ′ ″	Ann. Prec. ″
88	26	0 17 37·76	+2·582	43	168 6 57·7	−19·996
483	12	1 29 30·38	2·226	20	148 55 18·4	18·545
681	20	2 4 15·25	2·201	17	141 34 36·2	17·179
1044	11	3 13 49·30	2·116	17	133 39 28·8	−13·301
2151	15	6 27 53·62	+1·734	21	135 11 49·6	+ 2·435
2262	13	6 46 43·42	−1·198	16	162 56 49·7	4·060
2721	10	8 0 24·83	+1·684	20	140 9 21·5	10·059
5719	22	16 52 20·82	5·881	20	155 31 27·3	+ 5·835
6248	13	18 16 45·19	5·172	31	147 36 31·1	− 1·465
6804	15	19 43 11·16	6·232	20	159 9 23·0	8·727
7575	18	21 38 9·64	4·264	17	146 58 46·2	16·335
7656	18	21 51 36·75	4·182	22	147 24 37·9	16·990
7816	21	22 17 16·58	4·524	23	158 15 45·5	18·074
8080	17	23 4 30·58	3·459	21	140 26 56·7	19·470
8249	11	23 35 13·88	3·859	18	169 38 26·6	19·938
8260	18	23 38 25·10	+3·185	19	132 23 42·6	−19·966
3479	4	10 4 21·63	+1·700	6	154 45 42·1	+17·557
3481	4	10 4 26·70	+1·681	8	155 4 1·5	+17·559

Nos. 3479 and 3481 are not given in Mädler's list, but were observed on account of their proximity to the place assigned to No. 3482 of the B.A.C., which latter star *does not at present exist.*

Collecting from the various authorities the positions in R.A. and N.P.D., on which the place of 3482 depends, and bringing them up to January 1, 1847, by precession alone, we obtain

		R.A. h m s		N.P.D. ° ′ ″	
Lacaille (4184)	... ...	10 3 27·4		154 51 30·9	
Brisbane (2870)	2 obs. by mural	10 4 18·1	3 obs.	154 51 44·2	
	3 do. by transit	10 4 19·5			
Rümker (196)	2 obs.	10 4 27·9		154 52	

In the B.A.C. Rümker has been taken as the modern authority for R.A. and Brisbane for N.P.D.; the difference of 1^m between the R.A.'s of Lacaille and Rümker being attributed to proper motion of the star. On referring to the *Cœlum Australe Stelliferum*, the star observed by Lacaille will be found recorded in Zone x. April 26, 1752, "in parte inferiore," the times of ingress and egress being respectively $9^h\ 58^m\ 6^s$ and $10^h\ 3^m\ 20^s$. If 2^m be added to the time of egress, the place of the star for 1750 (employing the Reduction Tables given in the Catalogue of 9766 stars) will become

	h m s		° ′ ″
	10 1 42·2	N.P.D.	154 35 49
or brought up to 1847	10 4 25·2		155 4 7

The place for 1847 of B.A.C. 3481, from the Cape observations given above, is $10^h\ 4^m\ 26^s{\cdot}7$ N.P.D. 155° 4′ 1″·5. Thus the identity of Lacaille (4184) and B.A.C. 3481 is highly probable, and warrants the assumption of an error of 2^m in the original observations of the former.

The R.A. of Rümker (196) agrees pretty closely with the observed place of B.A.C. 3481, and the star observed by Brisbane in R.A. is probably identical with B.A.C. 3479; but his N.P.D. differs from that of the latter star by about 6′. Rümker has no observation in N.P.D. of (196); he gives the position to the nearest minute only.

The Astronomer Royal gave a description of the gigantic telescope erected by the Earl of Rosse, at Birr Castle, which he visited and carefully examined this autumn. The mode of grinding and polishing the speculum, the mounting, &c. were fully described and illustrated by models, and the residual difficulties stated. He also exhibited models of Mr. Lassell's grinding and polishing machine, and of the mounted instrument, dome, &c. It was clearly shewn that, though pursuing different courses, the Earl of Rosse and Mr. Lassell had each attained almost *absolute perfection* in figuring and polishing their specula, and that the difficulties in mounting, &c. were gradually overcoming by Lord Rosse, while they were already nearly got rid of by Mr. Lassell in his comparatively small instrument.

Mr. Drew, who has lately built and furnished a very convenient observatory at Southampton, adopts a collimating telescope for getting rid of his error of collimation. To this latter telescope he has attached a wire micrometer, which supplies the object to be viewed by the transit. He also uses the wire micrometer to measure the intervals of his wires. The results are more readily obtained than by slow moving stars, and he conceives with at least equal accuracy. Specimens of the determination of the intervals by both methods are given, which agree very nearly.

The Beaufoy Clock, which is lent by the Society to Mr. Drew, has been cleaned and set up in his observatory. Some remarkable irregularities have occurred in its rate, and when the weight and bob are nearly at the same height, the clock has stopped. In the present arrangement of the weight, it passes in front of the bob and about half an inch distant. Motion is communicated by the bob to the weight, either by the medium of the air or the play of the frame. It has been proposed to hang the weight on one side, out of the way, and so close to the clock-case as to touch it, in order that any oscillation may be prevented.

Hind's changing star has been carefully observed by Mr. Bond at Cambridge, U.S. "The colour is a brilliant red, not surpassed in intensity by any other star. With power 1500 there is no indication of a planetary disc. It was of the 6th magnitude on May 25th, and at our last observation had diminished to the 7·8th. There are thirty small stars within 6′ of it; and with one of these, of 15th magnitude, numerous observations of position and distance have been made at different times. The mean result is

1848·52 Position 212° 8′ Distance 116·″1

The differences from the mean are irregular and clearly accidental.

Mr. Bond remarks, that in the vicinity of *Procyon* three stars are missing, all within a few minutes' distance, viz. a star of 8th magnitude, Smyth's *Celestial Cycle*, p. 182, and both components of a double star 7th magnitude in Bessel's Zone 52.

Table to connect the Nomenclature of the A.S. Catalogue with that of the B.A. Catalogue. By Mr. Woollgar.

"The Astronomical Society's Catalogue has been in use upwards of twenty years, and stars are frequently quoted from it by the ordinal numbers only. In the British Association Catalogue there is no express column of reference to the former Catalogue. That Mr. Baily did not appropriate one for that purpose probably arose from the knowledge that the numbers of Taylor's *second* Catalogue are identical with those of the A.S.C., though he has omitted to point out in the preface to the B.A.C. the applicability, in most cases, of such mode of connecting the two catalogues.

"Where the reference is to *any other* of Taylor's Catalogues, this resource fails; but in these cases the defect may be supplied by the following

Supplemental Table of Connexion between the Numbers of the Astronomical Society's Catalogue aad the British Association Catalogue.

A.S.C.	B.A.C.	A.S.C.	B.A.C.	A.S.C.	B.A.C.	A.S.C.	B.A.C.	A.S.C.	B.A.C.
9	17	408	1150	805	2091	1101	3073	1835	5331
54	156	421	1181	808	2110	1102	3089	1848	5374
109	313	429	1206	811	2115	1105	3110	1864	5429
110	315	447	1253	856	2260	1124	3152	1890	5513
129	356	450	1259	891	2374	1137	3186	1910	5609
134	372	460	1284	895	2389	1160	3269	1968	5813
151	426	483	1331	909	2440	1167	3289	2010	5932
165	452	516	1391	926	2483	1178	3344	2149	6333
206	595	525	1413	927	2485	1196	3410	2157	6356
208	594	538	1438	950	2557	1199	3428	2195	6485
209	600	541	1444	965	2620	1309	3782	2205	6507
210	596	612	1614	971	2644	1314	3809	2216	6535
217	618	614	1611	982	2665	1395	4087	2241	6607
218	625	617	1618	992	2718	1409	4125	2285	6699
230	660	654	1701	997	2740	1410	4127	2308	6742
233	675	660	1717	1003	2755	1413	4140	2367	6907
246	737	663	1726	1007	2774	1416	4147	2476	7255
256	763	664	1725	1010	2785	1431	4197	2513	7370
263	781	689	1775	1025	2818	1485	4325	2642	7745
305	878	691	1782	1048	2913	1579	4623	2660	7781
313	901	692	1783	1052	2919	1592	4663	2717	7925
324	931	712	1841	1067	2950	1633	4767	2762	8053
351	989	725	1864	1071	2962	1642	4801	2774	8098
392	1126	737	1896	1078	2981	1657	4839	2844	8275
394	1125	766	1981	1084	3005	1667	4865	2871	8350

"A.S.C. 337 and 2460 [La Caille, 233 and 1692] are not in B.A.C.

"All the A.S.C. stars not contained in the above Table will be found in the B.A.C. under Taylor's name and with the signature ii. prefixed."

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